Colostomy for perianal sepsis with ecthyma gangrenosum in immunocompromised children

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Abstract: BACKGROUND Perianal sepsis with ecthyma gangrenosum is a severe and potentially mutilating complication in immunocompromised children. Therapies include antimicrobial treatment, incision and drainage, generous tissue debridement, and skin transplantation. PROCEDURE We describe 3 children with acute lymphoblastic leukemia having sepsis with Pseudomonas aeruginosa in febrile neutropenia and severe perianal infections treated relatively early with a protective colostomy. Indications for colostomy were nonhealing wounds, and ceaseless pain. RESULTS All patients showed a rapid reduction of pain. Complete wound healing was seen in 2 patients, and considerable pain reduction and increased quality of life were seen in a third patient during palliative care. CONCLUSIONS These results suggest that a protective colostomy should be considered early in the management of immunocompromised children with ecthyma gangrenosum.

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Colostomy for Perianal Sepsis With Ecthyma Gangrenosum in Immunocompromised Children

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Background: Perianal sepsis with ecthyma gangrenosum is a severe and potentially mutilating complication in immunocompromised children. Therapies include antimicrobial treatment, incision and drainage, generous tissue debridement, and skin transplantation.

Procedure: We describe 3 children with acute lymphoblastic leukemia having sepsis with *Pseudomonas aeruginosa* in febrile neutropenia and severe perianal infections treated relatively early with a protective colostomy. Indications for colostomy were nonhealing wounds, and ceaseless pain.

Results: All patients showed a rapid reduction of pain. Complete wound healing was seen in 2 patients, and considerable pain reduction and increased quality of life were seen in a third patient during palliative care.

Conclusions: These results suggest that a protective colostomy should be considered early in the management of immunocompromised children with ecthyma gangrenosum.

Key Words: colostomy, immunodeficiency, leukemia, children, *Pseudomonas aeruginosa*, ecthyma gangrenosum, perianal sepsis

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Perianal sepsis is a life-threatening and potentially mutilating complication in patients with acute leukemia and other malignancies, which occurs either at the onset of disease or as an adverse effect of chemotherapy.[1] Neutropenia represents a significant prognostic factor for infections in immunocompromised patients[2] and for perianal sepsis in particular. The gram-negative bacterium *Pseudomonas aeruginosa* (*PSA*) is a common pathogen that may cause severe opportunistic infections invading the skin, the subcutaneous fat layer, as well as mucus membranes of immunocompromised children. The perianal region and the axilla are particularly prone to pseudomonas-related skin infections.[3] Skin lesions at the perianal region may have serious consequences, including skin and soft-tissue necrosis including the sphincter apparatus. The latter may lead to lifelong incontinence. Treatment approaches include antimicrobial therapy, incision, vigorous tissue debridement, and skin transplantations.[4]

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Temporary colostomy may be used to keep stool out of the area of the colon and skin that is inflamed, infected, diseased, or newly operated on—this allows healing to take place. However, to the best of our knowledge, this approach has been reported so far in only 2 case series of perianal sepsis in immunocompromised children.[1,4] Whether to perform a diverting colostomy is controversial, and evidence concerning indication and appropriate timing for local surgery as well as for colostomy type is lacking.

The aim of the present study was to analyze the outcome after performing a diversion colostomy in 3 immunocompromised children with perianal sepsis and ecthyma gangrenosum (EG) as well as to review the literature.

PATIENTS AND METHODS

We describe 3 male patients aged 3.3 to 4.8 years with acute lymphoblastic leukemia suffering from *PSA* sepsis, febrile neutropenia, and severe perianal, ulcerative infections treated with a protective colostomy between January 2011 and December 2013 at the University Children's Hospital of Zurich, Switzerland (Table 1). All patients had neutropenia with an absolute neutrophil count < 0.5 g/L when a perianal lesion was first noted.

Case 1

A boy aged 3.3 years diagnosed with acute T-cell lymphoblastic leukemia (T-ALL) presented 4 months after the initiation of chemotherapy (AIEOP-BFM ALL 2009 trial protocol) with febrile neutropenia, oral mucositis, and painful defecation. The evaluation revealed pseudomonas sepsis. On physical examination, he showed a perianal and endoanal dark red swelling that displayed the typical clinical features and hallmarks of EG (Fig. 1A). Antimicrobial treatment was initiated with ceftazidime for 23 days, combined with ciprofloxacin for the first 10 days, as the isolate from the blood culture was resistant to gentamicin and showed only intermediate susceptibility against meropenem. Analgetic treatment consisted of fentanyl and acetaminophen. After 16 days, a first local debridement had to be performed and endoanal negative-pressure wound therapy using the VAC system was established (Fig. 1B). A second debridement followed 3 days later. The boy had regular passage of stool (4 to 5 times a day) under therapy with lactulose. Eventually, after another 4 days, because of a massive progression of the perianal lesion, a dismembered colostomy (Fig. 1C) was performed to prevent stool passage and to allow anterograde enemas. The patient's postoperative course was uncomplicated, and regular enemas could be performed easily without anesthesia. Chemotherapy was reinstalled 5 days after surgery; 1 day later, the patient was discharged from the hospital in good clinical condition, with a clean, granulating perianal wound. The patient showed progressive perianal healing (Fig. 1D) and no stoma-related complications were present. The reversal of the colostomy was uneventfully performed 9 months later. Defecation is normal.

TABLE 1. Children With Perianal EG and Sepsis With *PSA*

Patient	Age (y)	Underlying Disease	Neutrophils (g/L) at Diagnosis of EG	Blood Culture	Wound Culture	Anal Sphincter	No. Debridements Before Colostomy	Time to Colostomy After Diagnosis of EG (d)	Colostomy-related Complications	Colostomy Reversal (mo)	Outcome
1	3.3	T-ALL	0.4	*PSA*	Not assessed	Not affected	2	30	None	9	Complete healing
2	4.3	ALL	0.4	*PSA*	*PSA*	Partial destruction	2	25	None	18	Complete healing
3	4.8	Recurrent ALL (palliative)	0.1	*PSA*	No *PSA*	Not affected	1	43	Prolapse	None	Increased quality of life (pain reduction)

ALL indicates acute lymphoblastic leukemia; EG, ecthyma gangrenosum; *PSA*, *Pseudomonas aeruginosa*.

Case 2

A boy aged 4.3 years was transferred from a peripheral hospital to our center after presenting with pancytopenia (hemoglobin level, 7.1 g/L; white blood cell count, 0.8 g/L; neutrophil count, 0.4 g/L; platelet count, 57,000 g/L), fever, severe oral and anal mucositis, and a perianal skin lesion. At presentation to our institution, the patient had fever, oral and anal mucositis, constipation, pain, reduced oral food intake, and hypokalemia. The cultures from blood drawn 6 days before referral were positive for *PSA*, as were the oral and the perianal wound cultures on admission. Empiric antimicrobial therapy with meropenem, confirmed to be efficient by antimicrobial susceptibility testing, was administered for 3 weeks in total. Analgetic treatment consisted of fentanyl, acetaminophen, and metamizole. Bone marrow examination confirmed the suspected diagnosis of ALL, and chemotherapy (AIEOP-BFM ALL 2009) was initiated. Five days after admission, the first surgical debridement was performed, revealing a deep anal ulceration with partial involvement of the external anal sphincter. A second debridement performed 16 days later revealed progressive sphincter destruction. Therefore, a protective nondiverting double-barrel sigmoid colostomy was performed 1 day later to avoid the passage of stool, to reduce bacterial load at the wound site, and to promote wound healing. The postoperative course was uncomplicated, and the patient was discharged 7 days after surgery in good condition. In regular clinical controls, the patient showed complete healing of the perianal region within 7 days along with regular anal wink. Three months after surgery, rectal manometry showed regular efficiency of the anal sphincter. Eighteen months after the colostomy, a colostomy reversal was performed; the patient had an uneventful postoperative course and was discharged 4 days later in good clinical condition and with complete continence of stools.

Case 3

Patient 3 was a boy with Down syndrome, aged 4.8 years, who was diagnosed with ALL at the age of 2.7 years and subsequently treated according to the BFM ALL 2000 trial protocol.[5] After several episodes of febrile neutropenia with bacteremia, 25 months after the initial diagnosis of leukemia, an early bone marrow relapse was detected. Palliative chemotherapy with vincristine, asparaginase, and prednisone was initiated. Four weeks later, the patient presented with a painful perianal ulceration, febrile neutropenia, and sepsis. *PSA* grew from blood cultures, but it was not detected from swabs of the anal lesion. Antimicrobial treatment with meropenem was switched to ceftazidime and gentamicin after 6 days to allow outpatient treatment for 15 days in total. Analgetic treatment consisted of fentanyl, acetaminophen, and metamizole. The anal ulceration was initially managed with daily cleansing baths containing diluted povidone-iodine (Betadine). Because of the nonhealing perianal wound, increasing purulent discharge, and pain, a surgical wound debridement under general anesthesia was performed 4 weeks later. Because of still progressing discomfort and pain, a palliative loop sigmoid colostomy was performed 2 weeks later. The postoperative course was uncomplicated, and the patient was discharged after 4 days in good clinical condition. Approximately 2 months later, the patient presented with a prolapse of the colostomy that was manually reduced. The patient died 7 days later due to leukemia.

DISCUSSION

PSA in immunocompromised children may cause severe perianal sepsis with severe destructive skin and tissue infection, including the anal sphincter, manifesting as EG3. This is an opportunistic invasive infection with increased morbidity and mortality by ancillary neutropenia.[1] Conventional therapies include antibiotic treatment and local surgical therapies such as extensive debridement. Performing a protective colostomy in immunocompromised patients with EG must be considered, when local debridements and wound care are not efficient enough to allow wound healing to occur, and particularly when the anal

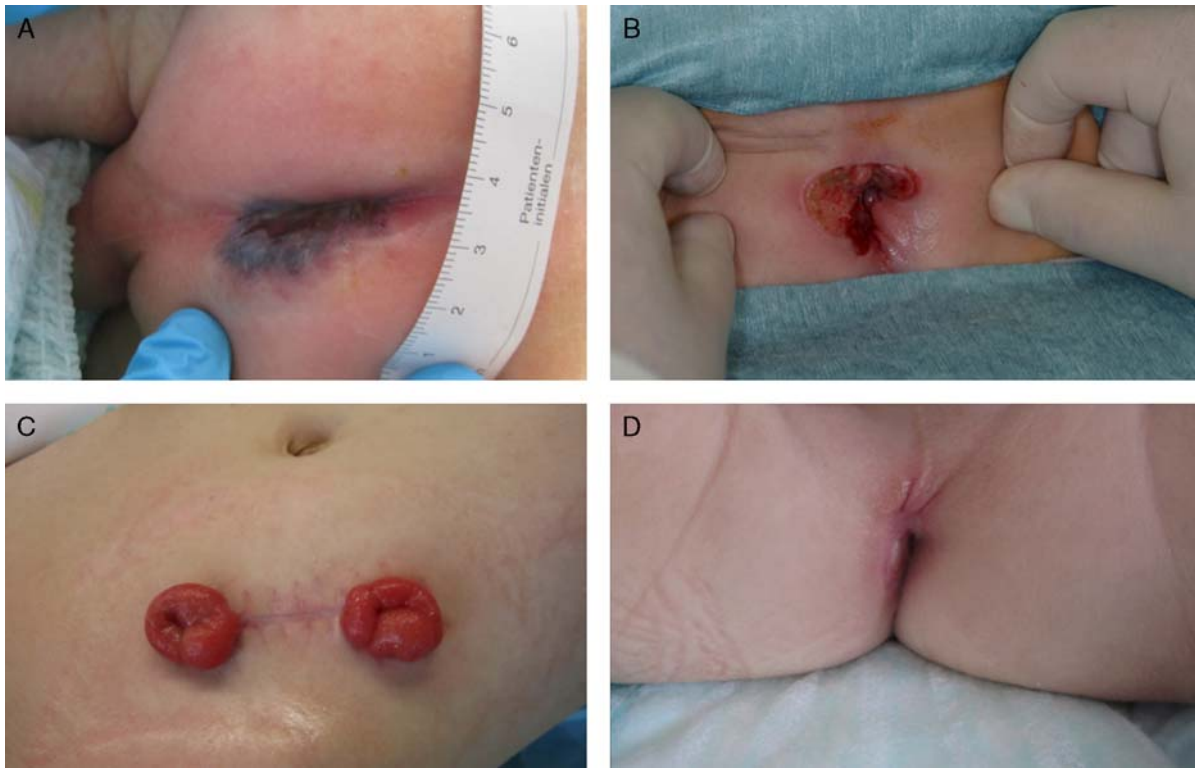

FIGURE 1. A, Typical clinical features of ecthyma gangrenosum. B, After 16 days, a first local debridement had to be performed. C, Because of a massive progression of the perianal lesion, a dismembered colostomy was performed. D, Soon after, the patient showed progressive perianal healing.

sphincter could be irreversibly damaged. Of note, it was shown to be effective in children with deep perianal burns.[6]

Chemotherapy and malnutrition may damage the mucosa in immunocompromised patients. Oropharyngeal and/or gastrointestinal bacterial translocation, referred to as endogenous bacteremia, as well as invasive necrotizing tissue infection may follow. From gastrointestinal colonization, promoted by antimicrobial pretreatment, *PSA* may invade the perianal region causing serious skin infections.[3] Among others, EG refers to a skin manifestation of pseudomonas infection that arises especially in immunocompromised patients.[7] Usually, EG manifests first as painless and enlarging macules becoming heightened papules and finally forming hemorrhagic bullae. After rupturing, these bullae evolve into gangrenous ulcers encircled by reddened skin.[3] Infection with *PSA* in immunocompromised patients often follows neutropenia that represents a significant prognostic factor.[2] Even when similar lesions are described by other gram-negative bacteria, including *Aeromonas hydrophila* and *Klebsiella pneumoniae*, as well as gram-positive bacteria (*Staphylococcus aureus* and *Streptococcus pyogenes*), fungi, or herpes simplex virus,[3,8] it is essential to early recognize and effectively treat pseudomonas-related skin infections with targeted antibiotics in the immunocompromised host.

Colostomies in the pediatric population may be performed for different purposes, including anorectal malformations and severe perianal burns.[6] They are mainly used to protect the distal colorectal tract from bacterial overload and from distention.[9] The different types of colostomies all have specific advantages and disadvantages. In loop colostomies, a bowel loop is pulled out and sutured to the abdominal wall, and 2 bowel openings are created, ending in a single stoma. The intestinal wall continuity is thereby partially preserved. Many (pediatric) surgeons use this technique, especially in emergency settings, as loop colostomies may be placed and reverted quickly.[10] Another type of colostomy that is typically performed in adult patients with perforated diverticulitis is the Hartmann procedure or end colostomy. Hereby, the involved sigmoid colon is resected and the proximal end is pulled out and sutured to the abdominal wall, whereas the distal/rectal stump is closed and left in the abdomen. Stoma reversal may be performed at a later stage.[11,12] A disadvantage of this technique is the loss of access for contrast studies and anterograde lavages. In contrast, the procedure may be performed quickly, the surgeon must create only 1 stoma, and stool cannot flow into the distal part.[9] A third type of colostomy is the double-barrel colostomy. Hereby, the intestine is completely divided, and both bowel ends are pulled out of the abdomen, creating 2 separate stomas. While a larger opening for the proximal bowel ending is created to enable stool passage, usually only a small mucus fistula is created at the distal ending. This enables contrast studies and anterograde enemas but (in comparison with end colostomies) increases the risk of a prolapse, which mainly occurs at the mobile portions of the colon. In situations where the distal colonic part should be protected from stool passage, such as in anorectal malformations,[13] but definitely also in patients with severe, nonhealing perianal skin lesions,[1] the 2 stomas should be separated, which

TABLE 2. Reported Cases of Immunocompromised Children With Perianal Skin Lesions Treated With Protective Colostomy

References	No. Patients	Age (y)	Underlying Disease	Neutrophils (g/L) at Diagnosis of EG	Blood Culture	Wound Culture	Anal Sphincter	Type of Colostomy	Colostomy Complications	Colostomy Duration (mo)	Outcome
Pini Prato et al[1]	3	0.3, 1.0, 4.5	i-ALL, LAM M7, ALL	≤0.5	2 × *PSA* 1 × *Escherichia coli*	No data	No data	3 × diverting	None	9, 10 1 × no data	3 × complete healing
Khalil et al[4]	4	No data	3 × ALL, 1 × no data	≤0.1	2 × *PSA* 1 × negative 1 × no data	3 × *PSA* 1 × no data	2 × complete loss 1 × partial destruction 1 × not affected	2 × end 2 × no data	No data	6, 8 2 × no data	No data
This study	3	3.3, 4.3, 4.8	2 × ALL, 1 × recurrent ALL (palliative)	< 0.5	3 × *PSA*	1 × *PSA* 1 × NA 1 × no *PSA*	2 × not affected 1 × partial destruction	1 × diverting 1 × nondiverting double barrel 1 × loop	1 × prolapse	2, 9, 18	2 × complete healing, 1 × increased quality of life (pain reduction)

i-ALL indicates infant acute lymphoblastic leukemia; LAM M7, acute megakaryocytic leukemia; *PSA*, *Pseudomonas aeruginosa*.

is referred to as a diverting colostomy (or dismembered colostomy). This allows only the proximal stoma to be covered with the stoma bag and prevents the mucus fistula from stool contamination.[9] For all stoma types, complications include prolapse, dehiscence, infection, parastomal hernia, retraction, and obstruction. In comparison with double-barrel colostomies, loop colostomies present a higher risk for prolapse formation.[10,14]

In the present study, 3 different colostomies were performed. Whereas the first patient was treated with a diverting double-barrel colostomy, the second patient was treated with a nondiverting double-barrel colostomy. Therefore, it is not surprising that patient 2 showed stool passage into the distal portion of the colon that was first noted 6 months after surgery. In patient 3, a loop colostomy was performed. Two months following the operation, this patient presented with stoma prolapse that was easily treated with manual reposition. All ostomies of this report were placed through open technique. On the basis of surgeons' experience, laparoscopic ostomy may offer less peristomal hernia and/or wound dehiscence risk. Routine barium enemas were performed in patients 1 and 2 prior stoma reversal showing unaffected distal colorectal tracts.

Table 2 gives an overview of the literature. Of the 7 previously reported immunocompromised children with perianal skin lesions treated with colostomy, 3 were treated with diverting colostomies, 2 patients with complete anal sphincter loss had end colostomies, and 2 had sigmoid colostomies without further description of the operative procedure. In all known patients (including the 7 patients depicted in the literature and the 3 patients described in the present report), no major complications and no stoma-related deaths occurred. This indicates that protective colostomy represents a valuable strategy in the management of EG in immunocompromised children. It results in rapid release of defecation-associated pain and prompt wound healing because of the very substantial bacterial load reduction.

In conclusion, based on the literature quoted above and in view of our own experience, diverting colostomy as performed in 4 of the reported 10 patients (including ours), seems to be the best option when an untractable perianal and endoanal EG is present. It is easy to create and has a low complication rate. It instantly guarantees a stool-free colorectum, allows for painless antegrade cleansing enemas, and leads to rapid and complete healing of the lesion. Clearly, such a dismembered colostomy must be placed before significant anal sphincter destruction has occurred.

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